

# Space News **ROUNDUP!**



GEMINI FLIGHT—Dr. Robert C. Seamans, associate administrator of NASA (left) takes a simulated flight in the Gemini flight simulator with Astronaut Neil A. Armstrong. He was here at the Manned Spacecraft Center for a review of operations last Thursday.

Dr. Robert Seamans Says:

## Follow-On Manned Programs All To Be Managed Here

Dr. Robert C. Seamans, associate administrator, NASA, said at a press conference here at the Manned Spacecraft Center last Thursday afternoon that any NASA follow-on manned space programs will be managed from MSC in the same sense that Gemini and Apollo are now being managed here.

Referring to the major investment of NASA, here at the Center, Seamans said the most important part of the investment is the trained team of people, which are second to none in the world.

Seamans was accompanied by Dr. George E. Mueller, associate administrator for Manned Space Flight and other officials from NASA headquarters here

to inspect hardware and tour the facilities.

Others in the group that arrived on Wednesday evening were: Robert F. Freitag, director, Manned Space Flight field center development; William E. Lilly, director, MSF program control; Clyde B. Bothmer, director, MSF man-

(Continued on Page 2)

## Apprentice Training Program Begins This Week At MSC

Just as medieval craftsmen used a system of apprentice training to bring young men into a trade or profession, today's space technology has caused a similar need in the highly-specialized trades evolving in the nation's manned spaceflight program.

Twenty young apprentices began a four-year work-and-learn training program here at the National Aeronautics and Space Administration Manned Spacecraft Center this week. During the four years training toward journeyman rating, the apprentices will receive some 6800 hours of shop experience and 1100 hours of classroom instruction.

The four trades in which the apprentices will train are "electronic instrument maker," "experimental machinist," "model-maker (wood and plastic)," and "spacecraft metalsmith."

Following a day-long briefing yesterday at the Center, the 20 apprentices began work in their

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## Cape Kennedy Spared Cleo's Fury; GT-2 Delay May Be Extended

The Cape Kennedy space center was spared the full fury of hurricane Cleo last Thursday night as it weakened after carving a 200 mile path of destruction up the Florida coast.

The second stage of Gemini Launch Vehicle-2 had been removed to a hangar prior to the arrival of Cleo. However the first stage of GLV-2 and five other launch vehicles were lashed in the stands at the Cape to ride out the winds of the hurricane.

In preparation for the hurricane, crews had sandbagged buildings and stowed or tied down all loose equipment, and placed classified documents in waterproof safes.

Two weeks ago NASA announced the GT-2 flight would be delayed due to a lightning strike which hit Gemini Launch Complex 19 at Cape Kennedy. The effect of the storm Cleo, may further delay the flight now scheduled for the fourth quarter of 1964.

Dr. Robert C. Seamans, NASA associate administrator, told newsmen here in Houston that because the GLV-2 was at least partially disassembled for

the storm, "means there will be a delay."

The lightning strike occurred during a severe thunderstorm on August 17, and damage was sustained by the launch complex as well as the Gemini launch vehicle.

Damage to the launch vehicle and ground checkout equipment will necessitate some

equipment replacement, complex revalidation and systems re-testing.

The overall effect of these conditions may result in a delay of the first manned flight into next year.

The unmanned flight of GT-2 will be a structural qualification and systems test of the vehicle and spacecraft.

## U of H Graduate Courses Offered To MSC Employees

Arrangements have been made to have selected University of Houston graduate courses conducted at the Manned Spacecraft Center during the 1964-65 school year it was announced last week by the Training Branch.

MCS employees wishing to enroll in any of the courses being offered, should send MSC Form 75 to the Training Branch before September 10. Also those employees who have not applied for admission to the University

should contact the Training Branch at Ext. 7311.

Arrangements have been made to allow late admissions to the Graduate School for MSC employees wishing to take

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## Oregon Moonscape Locations Used For Apollo Time and Motion Study

From Bend, Oregon, to the moon is 238,000 miles, but 13 MSC technicians took advantage of the similarities of some of the central Oregon terrain to the type of terrain expected on the lunar surface. Time and motion studies of test subjects wearing an interim Apollo pressure suit with thermal overgarment were run August 25-28.

Also evaluated were two versions of a lunar walker, a device designed to aid astronauts in walking in the one-sixth gravity field of the moon. The test subjects wore a back-pack portable life support system.

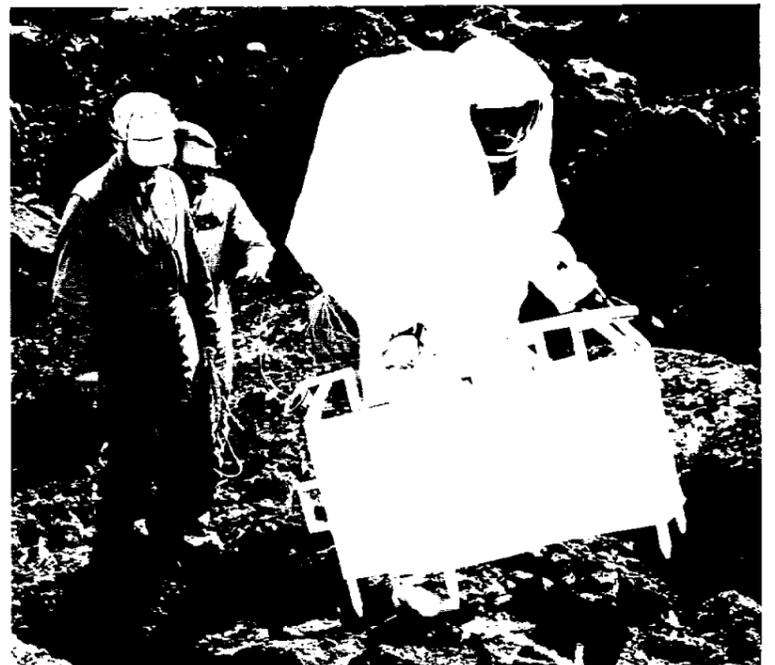
The first two days' test runs were made in a basaltic lava flow at McKenzie Pass, 50 miles northwest of Bend. A loose, powdery pumice deposit 50 miles south of Bend was the third day's location, and the last day was spent at an obsidian lava flow at Newbury Crater, 35 miles southeast of Bend.

Test Director Earl LaFevers, Crew Systems division, said, "The tests went exceptionally well. We are quite pleased with the data we obtained."

Astronaut Walter Cunning-

ham took part in the tests, alternating with Randy Hester and

Jack Slight, both of Crew Systems Division.



MOONSCAPE—Astronaut Walter Cunningham, with the aid of a Luna-Walker, wends his way over the rugged lava flow terrain of McKenzie Pass, 50 miles northwest of Bend, Oregon. With Cunningham are Earl LaFevers of the Space Medicine Branch of Crew Systems Division, who originated the Luna-Walker as an aid to walking on lumpy terrain, and Dr. John Ziegelschmid, a participant in the MSC Aerospace Medical Specialty Training Program, who was medical monitor for the tests.

### Holiday Next Monday

Be sure to stay home next Monday because it's Labor Day, and will be observed as a Federal legal holiday here at the Manned Spacecraft Center.

All offices will be closed and employees will be excused from duty without charge to leave or loss of pay, except those involved in functions considered essential for operations.

Supervisors should notify all employees required to work on the holiday as far in advance as possible.



INSPECTION TOUR—Gemini Program executives recently made an inspection tour of the Sacramento, Calif. Plant of the Aerojet-General Corporation. The touring group included Dr. Robert R. Gilruth (right center), director, Manned Spacecraft Center, and Dr. George Mueller (far right), associate administrator of the Office of Manned Space Flight. Also shown is Dr. Louis G. Dunn (left), with Aerojet-General.

## Apollo LES 'Man-Rating' Tests Stepped-Up

The remote silence of Lockheed Propulsion Company's sprawling Potrero Production and Test Facility near Beaumont, Calif., is being shattered with mounting frequency these days by the deep-throated roar of a rocket destined to play a major role in safeguarding the lives of America's lunar astronauts.

LPC test engineers recently announced successful conduct of three static test firings within the brief span of 24 hours in a stepped-up qualification phase of the Apollo launch escape motor's development to "man-rate" it well in advance of manned Apollo flights.

At last count, the motor was midway in the qualification phase with eight of 20 scheduled test firings already completed. An equal number of motors had been tested previously in the earlier development phase.

During the recent 24-hour period, LPC personnel test-fired under widely different environmental conditions three of the 15-foot-long solid propellant rocket motors, which are designed to provide the main impulse (155,000 pounds of thrust) to pull the Apollo spacecraft away from its Saturn V launch vehicle in the event of launch difficulties.

Before firing, the motors were exposed to controlled temperature environments of 20 degrees Fahrenheit, 70 degrees and 120 degrees, respectively, in

a complex of conditioning chambers at the Potrero facility.

An important phase of reliable rocket motor development at LPC involves test-firing of motors after exposure to temperature extremes far more severe than they might encounter in operational use. The

## Graduate Courses

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courses here at the Center.

Plans are also being made to conduct a special University of Houston registration at the Center. Details are to be announced later.

Courses to be offered are as follows: Fall Semester 1964—Higher Math for Science and Engineering; Gas Dynamics; Information Theory; Theoretical Problems in Engineering; Introduction to Mathematical Physics; and Higher Concepts in Linear Algebra.

Spring Semester 1965 — Higher Math for Science and Engineering; Engineering Systems Analysis; Numerical Methods in Engineering Analysis; Transform Applications in Engineering; Information Theory; Statistical Thermodynamics; and Introduction to Math Physics.

Questions concerning these courses should be addressed to the MSC Training Branch.

motors in all three cases, performed flawlessly, meeting rigid operating standards, Lockheed reported.

## Manned Programs

(Continued from Page 1)

agement operations; George Friedl Jr., deputy associate administrator for industry affairs; W. F. Boone, deputy associate administrator for defense affairs; and D. D. Wyatt, deputy associate administrator for programming.

Technical briefings were given the group on Thursday morning with a tour of buildings 13 and 16 before lunch.

In the afternoon the group toured other facilities here at the Center and inspected hardware in the various areas.

The group, which came here from touring the Marshall Space Flight Center, Huntsville, Ala., left Houston late Thursday afternoon for Washington and other points.

## Rocket Powered Moon Vehicle Being Designed For Astronauts

Preliminary designs of lightweight, rocket-powered vehicles, which someday may carry Apollo astronauts above the moon's surface on rescue and reconnaissance missions, now are underway at Textron's Bell Aerosystems Company in Buffalo, N.Y., for the National Aeronautics and Space Administration.

Bell has been awarded a \$199,333 contract by NASA's Marshall Space Flight Center, Huntsville, Ala., to conduct a design feasibility study of Lunar Flying Vehicles (LFV). This investigation is being conducted in conjunction with the Apollo Logistics Support System (ALSS).

Major effort of the 12-month study is being directed toward determining a feasible conceptual design for a vehicle to accompany a Mobile Laboratory (MOLAB) as it explores the lunar surface. This vehicle, according to NASA specifications, should be able to fly a minimum of 50-miles non-stop with two astronauts wearing space suits, including the Apollo back pack life support system.

The LFV will travel with the mobile laboratory and be available to rapidly carry the astronauts to safety from any lunar danger encountered or from a malfunctioning MOLAB. It could also be used to explore terrain inaccessible to the MOLAB or carry an astronaut on reconnaissance, surveying, photography or mapping missions.

As part of the study, Bell will determine the design requirements for all vehicle subsystems to be used by the LFV including propulsion, guidance, navigation, flight control, electrical power supply, communications and structure. It is known now that the LFV will have a throttleable propulsion system capable of hovering, of flying a flight path much like a helicopter.

Several environmental problems will have to be taken into consideration in designing the Lunar Flying Vehicle, "explained Program Technical Director Leonard M. Seale, chief

of Bell's space systems advanced design section.

One environmental problem Bell will consider, is that of lunar dust which may impair visibility, have impingement effects and cling to the vehicle.

Micrometeorite bombardments may present another significant environmental problem in designing appropriate protection for astronauts flying the LFV.

Other problems to overcome in designing the LFV include the temperature extremes and severe vacuum conditions encountered on the moon.

NASA presently envisions placing the MOLAB and LFV on the moon by an unmanned Lunar Excursion Module (LEM), called a LEM Truck. The vehicles will operate out of an ALSS base to explore the moon's surface.

## MSC Establishes Office To Coordinate Business Travel

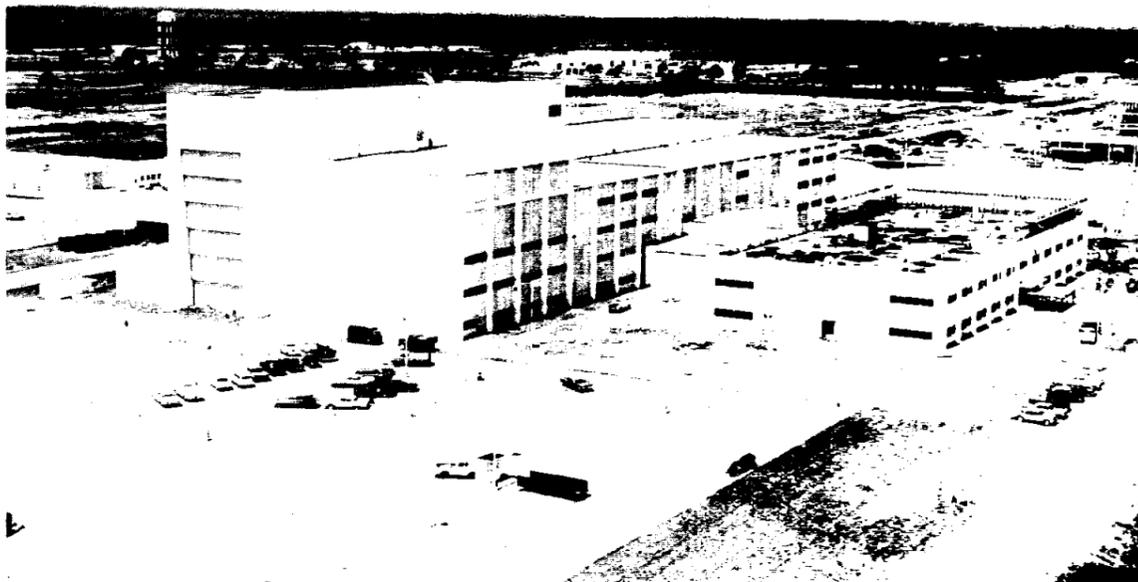
The position of Travel Coordination Officer was established recently in the office of the director to coordinate arrangements and administrative matters relating to foreign and domestic travel concerning Manned Spacecraft Center business.

Voula Tsitsera has been appointed to serve as Travel Coordination Officer and will work under the direction of Paul E. Purser, special assistant to the director.

She will also assist in the formulation of MSC budgetary requirements by developing cost estimates for travel approved in the office of the director.



ALTITUDE CHAMBER—The altitude chamber above is the largest piece of hardware to be moved from Cape Kennedy to Merritt Island, as Manned Spacecraft Center-Florida Operations employees begin their move this month.



OPERATIONS AND CHECKOUT BUILDING—Manned Spacecraft Center-Florida Operations employees and contractual employees started this month to occupy new facilities in the Operations and Checkout Building on Merritt Island. The 575,000 square foot, reinforced concrete structure is 106 feet high and contains engineering and administrative areas, and high and low bay areas for spacecraft assembly, test and servicing.

## Apprentice Training

(Continued from Page 1)

chosen fields and attended related classes at the University of Houston and San Jacinto Junior College.

Instruction courses vary with the trade and include courses in higher mathematics, chemistry, physics, electronic circuitry and civil engineering as well as in academic subjects such as English and report writing.

On-the-job practical training for apprentice Electronic Instrument Makers include 6800 hours in such fields as layout and finishing instrument panels and cabinets, constructing, test-

ing and calibrating of electronic test equipment, assisting in conducting tests and experiments, preparing circuit diagrams, making laboratory set-ups and servicing and repairing instruments.

Experimental machinist apprentices will get some 6800 hours instruction in the operation of drill press, engine lathe, boring machine, milling machine, shaper, planer, grinders of various types as well as related instruction in maintenance of machinery and equipment.

The 6800 hours of shop training for apprentice modelmakers include general bench work, use of measuring tools and gauges,

hand-cutting tools, template construction, and operation of wood and plastic working machines.

Spacecraft metalsmith apprentices will receive their 6800 hours of shop training in various phases of forming, cutting and welding sheet metal. In addition, their training will cover die forming and jig and fixture work.

Selection of the 20 apprentices starting training this September was made through competitive examinations conducted by the U.S. Board of Civil Service Examiners.

The Apprentice Training Program is under the direction of the Training Branch of the Manned Spacecraft Center. Robert Senter, former industrial arts teacher from Friendswood High School is supervising the program.

Apprentice electronic instrument makers starting their first year are Max Barnett, William H. Sigafosse and Donald M. Jordan all of Houston; Allan Manning, Hooks, Tex.; and Marvin F. Williams Jr., Freeport, Tex.

Experimental machinists apprentices are Fred T. Simon, Deer Park, Tex.; Joseph M. Schmitt, Houston; Clarence J. Fisher Jr., Round Lake, Ill.; Robert G. Lahun, Friendswood, Tex.; and Jerry D. Allen, Atmore, Ala.

Spacecraft metalsmith apprentices are Jesse T. Adkins Jr., Missouri City, Tex.; Melvin L. Patrick, Abilene, Tex.; Charles A. Moore, and Garlan B. Moreland, both of Houston.

Modelmaker apprentices are Craig Pemberton, Friendswood, Tex.; Don Andrews, Seabrook, Tex.; Campbell P. Canup, Tomball, Tex.; Percy H. Alison, San Antonio; and James M. Peterson, and Lawrence A. Hagman, both of Houston.



**STATIC FIRING TV**—A miniaturized television is shown being installed in the tail section of a Saturn V vehicle mock-up at the Marshall Space Flight Center. The camera, which weighs only two pounds in its environmental housing, will make it possible to watch various components within the booster during static firing.

## Apollo Boilerplate Spacecrafts Delivered, To Be Flown With Pegasus Satellites

Two Project Apollo spacecraft test vehicles arrived at the John F. Kennedy Space Center, NASA at Cape Kennedy last month and are scheduled for

launching into orbit with the meteoroid investigation satellite, Pegasus, late this year and early 1965.

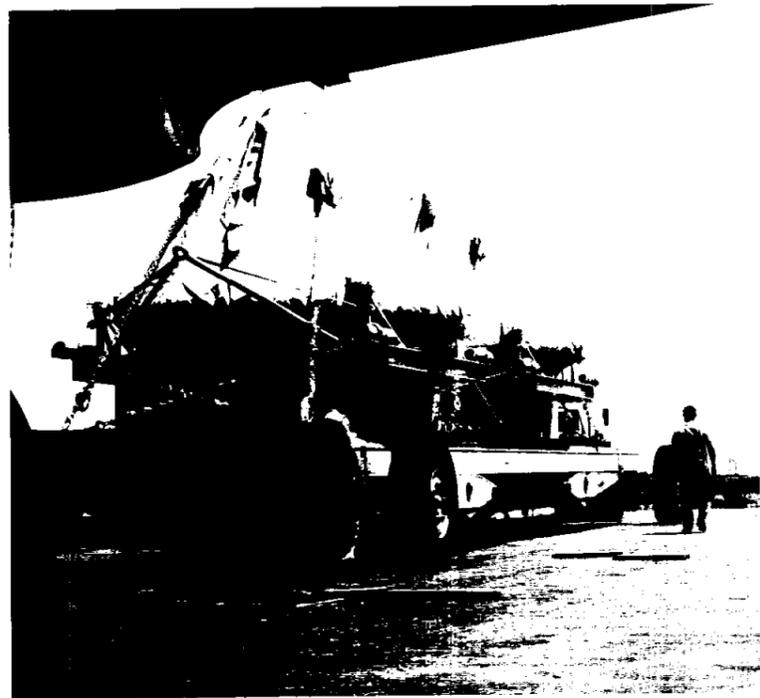
The Apollo boilerplate engi-

neering test models 26 and 16, resemble the spacecraft command module which will carry American astronauts to the moon.

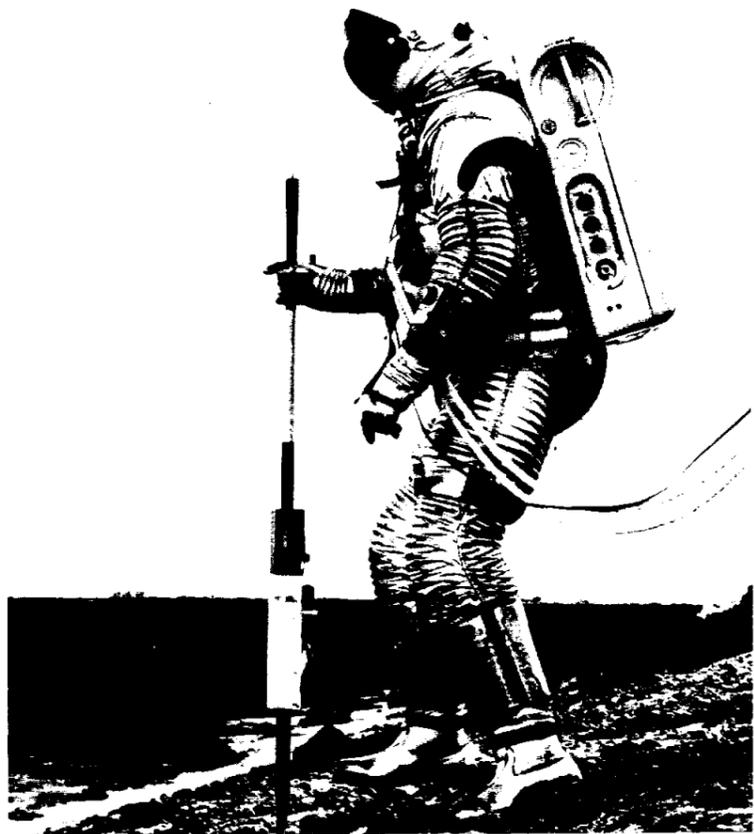
The service modules, which will be mated with the command module test vehicle, were shipped to the NASA Marshall Space Flight Center, Huntsville, Ala., earlier this year to be equipped with aluminum coated mylar wing-like panels 96 feet long and 14 feet wide. The Pegasus panels will unfold after the spacecraft is launched into orbit by a Saturn I vehicle and meteoroid penetration will be transmitted to earth.

The Apollo boilerplates were shipped to Cape Kennedy from North American Aviation's Space and Information Systems Division at Downey, Calif. aboard a modified four-engine Strato-cruiser called the Pregnant Guppy. Test launch escape systems for the two command modules were shipped by truck.

Officials here at the NASA Manned Spacecraft Center said manufacturing operations were accelerated to enable both boilerplate spacecraft to be shipped at the same time.



**APOLLO BOILERPLATES**—Apollo command module boilerplates 26 and 16 are shown as they were off-loaded from the "Pregnant Guppy" aircraft at Cape Kennedy. They were then transported to Hanger AF to prepare them for the SA-7 and SA-8 launches.



**DRESS REHEARSAL**—Engineer Randolph Hester, wearing a pressurized space suit and 30-pound back-pack containing oxygen for coolant, pressurization and breathing, traverses down a slope here at the NASA Manned Spacecraft Center, using a modified "Jacob Staff," designed to help him keep his balance, carry some of the tools an astronaut might use on the moon and assist in taking measurements. The test was part of a dress rehearsal for a Crew Performance analysis which took place at Bend, Ore., August 24-28.

## Pegasus Is Name Designated For Meteoroid Investigation Satellite

The name "Pegasus" has been chosen by the National Aeronautics and Space Administration for a new satellite which will investigate the hazard of meteoroids in space, the NASA-Marshall Space Flight Center announced.

Pegasus gets its name from the flying horse of mythology. The satellite has a wing-like panel 96 feet long and 14 feet wide. Pegasus will sweep through space hundreds of miles above earth and transmit to earth the penetration of meteoroids on its panels.

For launch aboard a Saturn I rocket, the satellite panels will

be folded up. Once in orbit, the panels will spread. Pegasus will be among the largest objects in orbit.

As a result of the project name, the payloads for SA-9, SA-8, and SA-10 will be designated Pegasus A, Pegasus B, and Pegasus C, respectively.

Field management of the project is by the Marshall Center.



**MOSQUITO CONTROL**—The Manned Spacecraft Center has been doing its part in controlling the area mosquito population. Here a contractor employee operates a fogging machine around one of the buildings at the Center.

# Electro-Mechanical Research Supplying Telemetry And Data

Electro-Mechanical Research, Inc. (EMR) of Sarasota, Fla., is known wherever the science of telemetry is practiced. Established in 1941 the 23 year old company has virtually grown up with the U.S. aerospace indus-



GORDON S. SLOUGHTER, president and chief executive officer of Electro-Mechanical Research, Inc.

try. A basic company policy of self-sponsored research and development has led to many original concepts which have afforded continuing and major contributions to the solutions of problems of communicating ever increasing quantities of data over longer distances with greater precision.

Because of the great fund of knowledge and experience which EMR has brought to bear on telemetry problems, and which is reflected in the company's equipment, virtually every U.S. launched missile, spacecraft, and satellite that has been required to send back information concerning itself or its environment has done so with the aid of some EMR telemetry equipment or system.

Cases in point in which EMR equipment has played a major role include Tiros, Nimbus, Tel-

star, Ranger, and IMP satellites, Saturn IV, Delta, Nike Zeus, Titan, Polaris, and many other missiles, as well as Project Mercury manned spacecraft.

EMR, a subsidiary of Schlumberger Limited of Houston, Tex., consists of three divisions and several smaller specialized research and production facilities. Of the EMR organizations, the Sarasota Division is by far the largest, employing nearly two-thirds of the 2,000 total company personnel.

While the Sarasota Division is devoted entirely to telemetry and data systems management, other divisions produce general-purpose digital computers, multiplier phototubes for space research, precision data filters, shaft position digital encoders, and satellite instrumentation and integration services.

The company conducts continuous applied research pro-

grams concerning space communications, data acquisition and processing, missile and satellite instrumentation, electro-optics, digital and analog television, information theory, and other related fields.

The company is particularly proud of the performance records of EMR telemetry equipment in the field. As an example, EMR's 14-band telemeter designed for USAF Titan flights experienced no failures whatsoever in 20 flights of 60 complete telemetry packages.

NASA records show that during Project Mercury manned flights performance of telemetry systems, major components of which were made by EMR, performed outstandingly well. In fact, by the time the MA-9 spacecraft was launched the EMR backup telemetry transmitter was deleted to save weight because its performance had proved to be so reliable.

This performance and experience are carried over into the next NASA manned spacecraft venture—Project Gemini. EMR

was chosen as a major subcontractor to supply the critical spacecraft data recording and data transmission system as well as ground checkout systems to McDonnell Aircraft Corporation.

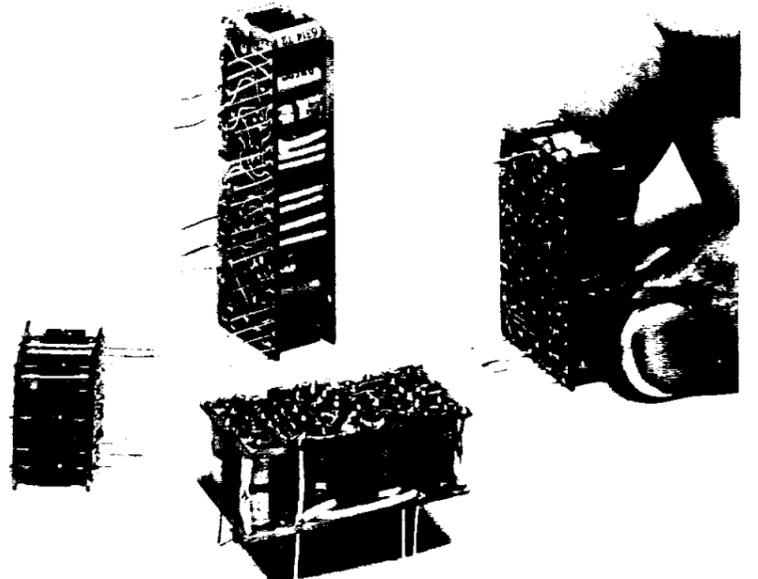
The EMR spacecraft digital telemetry system multiplexes and digitally encodes up to 370 data inputs pertaining to the spacecraft and its two-man crew during orbital maneuvers. This EMR system is one of the most complex in the spacecraft. Advanced packaging design techniques have given it a packaging density of 34,000 parts per cubic foot and the highest system weight-to-structure ratio (14.5 to 1) in the spacecraft electronics.

Although containing well over 3,000 transistors the unit consumes less than 7 watts of power and has a predicted reliability equivalent to 4100 hours.

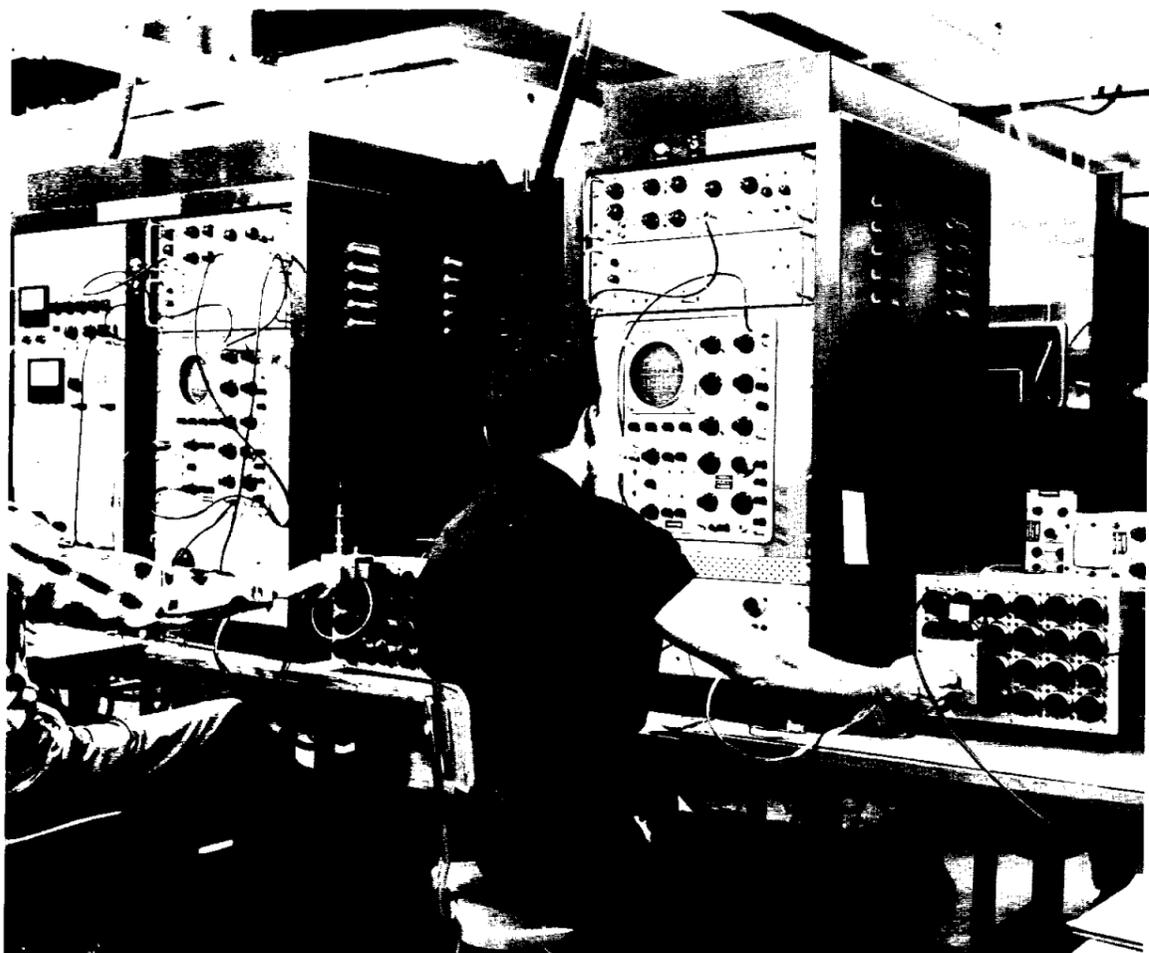
All digital circuitry in the spacecraft system is made redundant so that a failure of any single component in one of



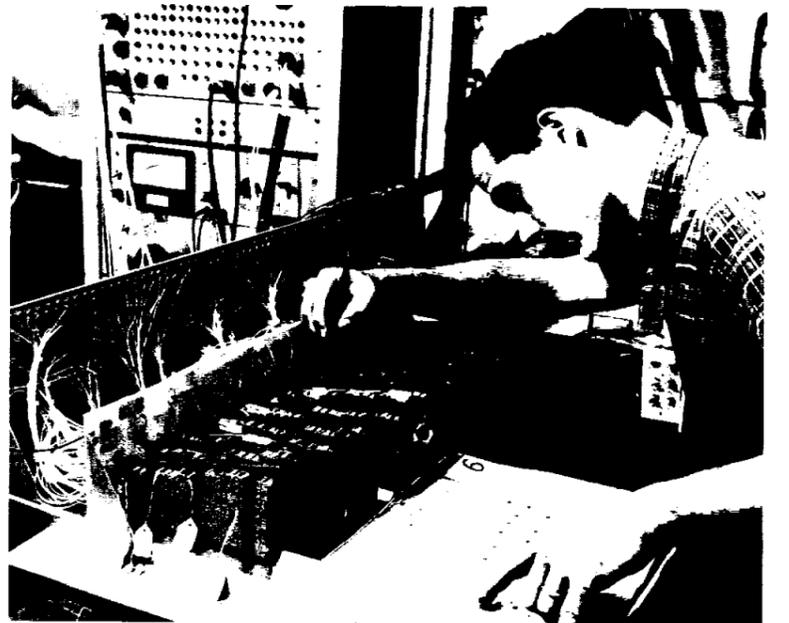
FLORIDA PLANT—The EMR Sarasota Division plant in Sarasota, Fla.



DATA TRANSMISSION SYSTEM—Typical modules of the Gemini spacecraft data transmission system. Each module is made up of parts which are selected in a rigorous 100% piece-part selection program; parts are selected and made up into kits (for each module); part histories follow the module through to the completed unit.



MODULE CHECK OUT—Test technicians check out Gemini modules using EMR designed Modular Test Sets. Up to 140 different logic module configurations can be tested simply by changing plug-in test adapters.



PCM SYSTEM CHECK—EMR test technician, Robert Wilson, checks out initial assembly of Gemini spacecraft pulse code modulation (PCM) system programmer modules using EMR designed automatic test set. With this automatic test set, performance of subsystem components down to the module level can be checked out very rapidly.



**TWENTY YEAR AWARDS**—Robert Zimmerman (left), Personnel Division, recently presented 20-year awards to (l. to r.) O'Tulsa Placker, Kathryn R. Anderson, and Thomas A. Dorrrough, all of the Personnel Division.

## MSC Annual Picnic Tickets To Go On Sale Next Week

An estimated 4,500 persons are expected to attend the annual MSC Family Picnic at the Galveston County Park on Sunday, September 27.

The festive occasion will start at noon with food being served from 1 to 3 p.m. On the menu will be barbeque chicken (one-half per plate), baked beans, potato salad, french bread, and various condiments. There will be plenty of food for all.

An unlimited supply of hot and cold beverages for adults and children will be available all afternoon.

Children's activities and adult entertainment will be taking place during the entire afternoon.

The children's activities will include games and contests with lots of prizes and trophies, pony rides, continuous cartoons and movies, and amusement rides.

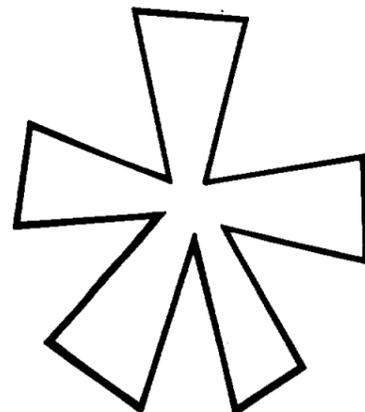
Adult entertainment will include dancing, square dance exhibition by the Dixie Twirlers, a male leg beauty contest, exhibition sports, equipment for participation sports will be available, and boating facilities for the boaters.

Ticket sales will begin September 9 and continue through September 22. The cut-off date is necessary to allow the food committee time to order the necessary amount of food.

The ticket prices will be \$1

for adults and 50 cents for children under 11 years of age. Children under five years will be admitted free.

Tickets will be on sale at the MSC cafeteria and at various



When you see this emblem . . . THINK PICNIC! . . . Think MSC FAMILY PICNIC! Remember the date is Sunday, September 27.

points throughout the center or from any Employees Activities Association representative, or member of the picnic committee.

Co-chairmen of the MSC Family Picnic are Tony Yeater and Marilyn Bocking.

Committee members are: food, Jim McBarron; beverages, Wilfred A. Brugger; tickets, Helen Patterson and John Rife; children's activities, Lois Bradshaw, Gene Edmonds, and Ragan Edmiston; adult activities, Betsy Mason (sports), and Voula Tsitsera (program); trophies/prizes, Bobbie Wright, and Flossie Leggett.

The clean-up committee will be headed by Lloyd Yorker; dancing, Maggie Taylor, and Don Incerto; publicity, Colin Kennedy; movies/public address system, Dick Tannery, and Forrest Sealey; parking, Lloyd Yorker; information booth, Joyce Lowe, and Carol Brinkmann; and first aid, Dave Bell.

## Mixed League Bowling Starts September 14

The 16-team NASA Mixed Bowling League is scheduled to begin play at 6 p.m., Monday, September 14, at the Bayou Bowl in Dickinson, Tex.

All league members are requested to be present this first evening by 5:30 p.m. for a general meeting before the bowling begins.

Any question regarding this league may be directed to Chetta Barnes at Ext. 34761.

## Increase For Wage Board Employees To Be Included In This Week's Checks

Pay raises will be included in the September 4 checks of some 230 Manned Spacecraft Center Wage Board employees in the Houston area.

The new pay schedules, averaging 11 cents per hour increase, apply to non-supervisory, leader, and supervisory Wage Board personnel.

Higher rates were authorized in order to adjust wages to those paid by private industry in the Houston locality.

The effective date for the new Wage Board pay rates was August 16. The pay period beginning on that date closes August 29.

## NASA Employees Benefit Association To Conduct Insurance Enrollment Drive

The NASA Employees Benefit Association has scheduled an enrollment drive this month to enroll Manned Spacecraft Center employees, not currently en-

rolled, in the NASA Group Life Insurance Plan.

Any full-time, permanent employee is eligible to enroll in the plan and female employees may

obtain the same amounts of insurance as the men.

W. Kemble Johnson, president of the MSC chapter of the association said, "NASA's group plan is the sensible way to get additional family protection at amazingly low rates. And now, the cost of this protection has been lowered further due to the increased membership."

"Since 1952, NASA has been pooling its life insurance purchases to get higher protection for the lowest dollar cost and now over \$175-million of life insurance safeguards the financial security of NASA families," Johnson stated.

Johnson said, "As membership in the plan has increased, the cost has gone down. The new rate, \$.95 quarterly per \$1,000 of life insurance plus 15 cents a quarter for each \$1,000 of accidental death benefits, is the lowest in the history of the plan."

Because many employees may not be aware of the plan's advantages, representatives of the company that underwrites the plan will conduct informational meetings September 8, 9, and 10 at various sites.

The current enrollment period ends September 21. The time and location of the meetings will be announced.



**PERFORMANCE AWARD**—Lee R. Nichols, center, executive assistant, Flight Crew Support Division, is presented a Sustained Superior Performance award by Donald K. Slayton, right, assistant director for Flight Crew Operations. Warren J. North, Flight Crew Support Division chief, looks on.

## Test Your Security I. Q.

1. Uncleared visitors to MSC wear badges containing stripes of the following color:

- (a) Blue (b) Red (c) Yellow (d) Green

2. How many times should the dial be turned when locking classified storage containers?

- (a) One (b) Two (c) Three

(d) Four

3. Is Confidential Restricted Data information subject to accountability procedures at MSC?

- (a) Yes (b) No (c) Only when a Division Chief or higher authority determines that it should be.

4. Fill in the correct word. Secret information is defense information, the unauthorized disclosure of which could result in \_\_\_\_\_ damage to the nation.

- (a) Grave (b) Great (c) Serious (d) Considerable

5. Which of the following factors are *not* required to be determined before access to classified information can be given to another person?

- (a) Identification (b) Clearance (c) Position (d) Need-to-know

Answers on page 5-A



Authorized hourly pay rates listed on this wage schedule apply only to NASA wage board employees assigned within commuting distance of Manned Spacecraft Center

WB	Non-Supervisory				WL	Leader				WS	Supervisory			
	1	2	3	4		1	2	3	4		1	2	3	4
1	1.90	2.00	2.10	2.20	1	2.09	2.20	2.31	2.42	1	2.63	2.77	2.91	3.05
2	2.03	2.14	2.25	2.35	2	2.23	2.35	2.47	2.59	2	2.87	3.02	3.17	3.32
3	2.16	2.27	2.38	2.50	3	2.38	2.50	2.63	2.75	3	3.14	3.31	3.48	3.64
4	2.29	2.41	2.53	2.65	4	2.52	2.65	2.78	2.92	4	3.28	3.45	3.62	3.80
5	2.41	2.54	2.67	2.79	5	2.65	2.79	2.93	3.07	5	3.40	3.58	3.76	3.94
6	2.55	2.68	2.81	2.95	6	2.80	2.95	3.10	3.25	6	3.53	3.72	3.91	4.09
7	2.67	2.81	2.95	3.09	7	2.94	3.09	3.24	3.40	7	3.66	3.85	4.04	4.24
8	2.80	2.95	3.10	3.25	8	3.09	3.25	3.41	3.58	8	3.79	3.99	4.19	4.39
9	2.93	3.08	3.23	3.39	9	3.22	3.39	3.56	3.73	9	3.98	4.19	4.40	4.61
10	3.06	3.22	3.38	3.54	10	3.36	3.54	3.72	3.89	10	4.13	4.35	4.57	4.79
11	3.28	3.45	3.62	3.80	11	3.61	3.80	3.99	4.18	11	4.44	4.67	4.90	5.14
12	3.50	3.68	3.86	4.05	12	3.85	4.05	4.25	4.46	12	4.74	4.99	5.24	5.49
13	3.71	3.90	4.10	4.29						13	5.04	5.31	5.58	5.84
										14	5.36	5.64	5.92	6.20

Shift Differentials: 2nd Shift: .08—3rd Shift: .12

This schedule supersedes the schedule approved 7/30/63.

# 1965 UF Drive Goals Announced

The badge of good citizenship soon will be passed around again at the Manned Spacecraft Center starting October 1, and more established residents of the Greater Houston community are anxious to see if it will be accepted as wholeheartedly as it was last year.

It will be—by every member of the local NASA family—if MSC'ers Donald T. Gregory and Elwyn (Tony) Yeater are able to "sell" their fellow workers as well as they have sold themselves on the value of this good citizenship.

The badge of good citizenship in the Houston area is the generously-filled-out-and-signed United Fund pledge card. It is by this UF pledge, Gregory said, that residents of this community establish themselves as "not just people who live here but who belong to the society of people who care."

Nearly four in five Houston area families do care enough, he pointed out, to contribute through United Fund to provide the operating funds for 65 member agencies which give hope to the homeless, the blind, the crippled, the mentally handicapped, the deaf, the sick, the disturbed, the aged.

Also, such United Fund agencies as those providing opportunities for wholesome, well-directed recreation for youth—making this a better community for all of us.

"And," Yeater added, "65 such vital agencies as these in Houston and Harris County's United Fund deserve the adequate support of all of us. Every MSC employee surely can give at least the price of a package of cigarettes, or 35c, a week to



PICTURE LIFE through the eyes of a child with impaired hearing. Such a child often used to be regarded as "dumb," lacking in intelligence. We know better today, and Houston Speech & Hearing Center, a United Fund agency, helps children like Val live a normal happy life.

keep these 65 agencies going through 1965."

Yeater is in charge of the UF drive at the Manned Spacecraft Center with Paul Sturtevant and Phil Hamburger serving as vice-chairmen. Gregory, who was in charge of this post last year's UF drive, has moved up to head the entire Federal Employees Unit in Harris County's drive.

Goal for the 1965 UF drive in Harris County—by far the largest volunteer undertaking in the community—is \$6,864,685. MSC's quota will be announced later. Yeater plans to emphasize the "pledge" (whereby the contributor can pay in monthly or quarterly payments) as an easier and more practical way to support UF generously than the "passing-the-hat" type of giving.

Those persons not living in Harris County and wishing to give to the UF drive in their own county may do so through the MSC/UF fund drive.

To do this and still give credit to the MSC/UF fund drive, indicate on the pledge card the area in which you live, other than Harris County, and specify that it is your wish to contribute in that area's UF drive.

The UF headquarters in that area will be notified of your wishes and receive your donation or pledge card.



LEAGUE WINNERS—The MSC Couples League winners in summer bowling this year were the Cotton Pickers with 29½ wins to 10½ losses. Trophies were awarded to the team members above (l. to r.) Willie Faye Junke, Leon Galler, Ruth Galler, Ray Donatto, and Doris Donatto.

## Small Boat Handling Course Offered MSC Employees At La Porte School

Free classes in navigation, small boat handling, and safety at sea will be offered to MSC employees and the public by Galveston Bay Power Squadron with registration to be held 7:00 p.m., Tuesday, September 15, at the cafeteria of the La Porte High School in La Porte.

The course consists of 14 weekly lectures. Subjects covered include rules of the nautical road, equipment required by law, seamanship, the compass, and chartwork. An examination concludes the

course. Classes are open to men and women, regardless of whether or not they own a boat.

All persons interested in pleasure boating and in getting more enjoyment and safety while afloat are encouraged to register and take this free course of instruction.

For additional information write or call C. N. Forsvall Jr. AP, 1503 Hemlock Drive, Pasadena, phone GR 2-3219, or H. E. Einfeldt, JN, P. O. Box 125, La Porte, phone GA 1-0388.

## Safe Boating Course To Be Offered Here

A safe boating course, open to the public, will be offered to the public and MSC employees, by U.S. Coast Guard Auxiliary members beginning Thursday, September 17.

The eight-week course will be held in the auditorium here at the Manned Spacecraft Center and will last from 7:30 to 9:30 p.m. each Thursday evening.

Included in the course will be the use of charts, compasses and minor navigation equipment, marlinspike seamanship, motor boat handling, equipment, lights required by the Coast Guard, rules of the nautical road, buoys, markers and other aids to navigation.

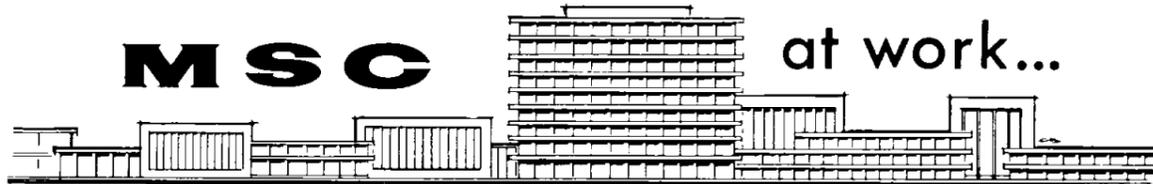
Boating safety, courtesy and consideration, signalling, and first aid will also be included in the course.

Part of the course will include demonstrations in motor boat handling, with the actual in the water demonstration being held at a local dock.

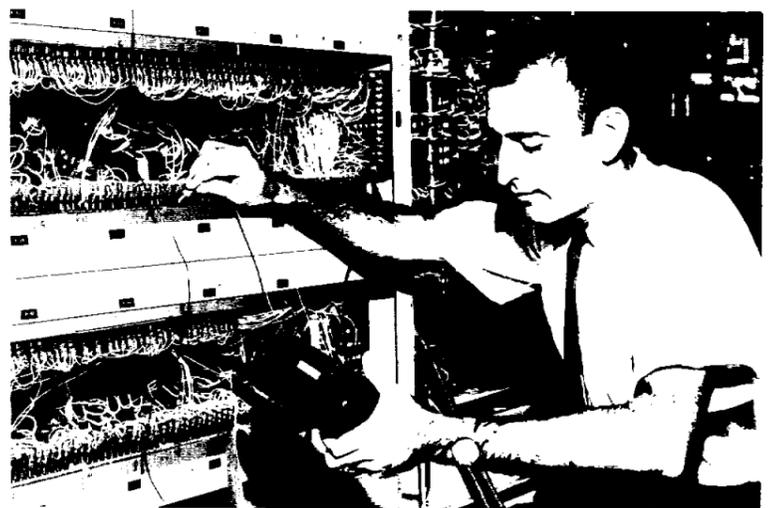
Additional information may be obtained by calling Jim Bailey at HU 3-7505.

# MSC

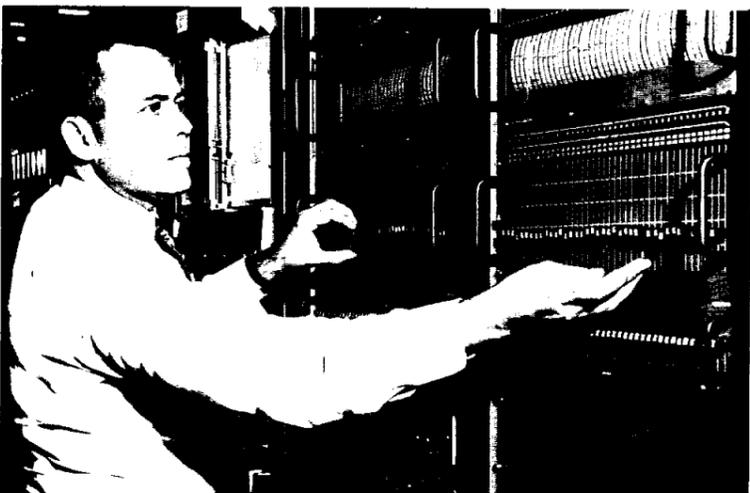
## at work...



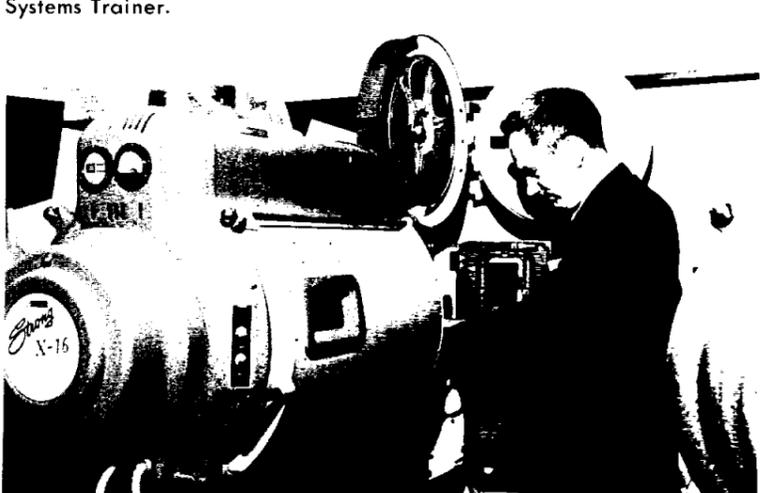
JESSEE PHILLIPS, Mechanical and Landing System Branch of the Structures and Mechanics Division, makes charts on successful bailout probability under different abort and re-entry trajectories.



CHARLES DESSENS, electrical engineer, Spacecraft Systems Operation Branch of the Flight Crew Support Division, test the circuitry of the Gemini Systems Trainer.



BILL M. ADAMS, Experimental Dynamics Section, Structural Facilities Branch of the Structures and Mechanics Division, makes settings on the random noise console for the vibration system.



GEORGE GAFFNEY JR., Audio Visual Services Branch of the Public Affairs Office, threads the 35mm motion picture projector in the projection booth of the MSC auditorium.

### ANSWERS

#### TO SECURITY I. Q.

1. (b); 2. (d); 3. (a); 4. (c); 5. (c).

For further information concerning this quiz and the regulations which establish the security requirements outlined, contact the Security Office at HU 3-3331. Suggested questions to be used in future quizzes should be submitted to the Security Office in Building Two.

# Systems For Gemini Program

these circuits has no effect on the operation. The two types of EMR ground support checkout equipment for Project Gemini perform automatic qualification of the data transmission system before its installation in the spacecraft and overall spacecraft systems predelivery and pre-flight checkout.

Both checkout systems fully exercise and calibrate spacecraft data channels printing out automatically any out-of-limits data and stopping the test when such events occur. The automatic program test sequences permit equipment and spacecraft checkout in one-fortieth of the time which would normally be taken to perform the tests manually.

In addition to supplying Gemini spacecraft telemetry, EMR also has the prime contract to design and build twenty ground pulse code modulation (PCM) data acquisition and reduction telemetry stations which will acquire and decommutate telemetry data from Gemini flights. The last of these PCM ground decommutation systems was completed on schedule this summer and delivered for installation on the newly implemented NASA manned space flight tracking range.

Each of these EMR systems contains over 15,000 transistors, nearly 10 miles of wire and over 100,000 connections.

Provision is made for exceptionally fast automatic format switching to permit acquisition of telemetry signals from several different types of spacecraft which may be passing over the tracking station in rapid succession. Mission formats of four satellites or spacecraft can be selected and activated from a central remote location or locally at the station itself.

Systems installed to date have

met reliability goals and have performed perfectly during mission simulation checkout and training exercises.

A natural outgrowth of long-term company sponsored theoretical studies on information theory and means for compressing transmission bandwidths has led EMR to study of television systems. Bandwidth compression studies highlighted the need for a variable parameter digital laboratory television system of considerable flexibility.

The EMR designed system which fills this need called EDITS (Experimental Digital Television System) was designed primarily as an instrument for the study of television data compression systems.

Use of the EDITS system has shed new light on means of eliminating redundancy from video signals and has been invaluable in a number of NASA television system study programs on digital TV including study of optimum digital video modulation system for deep-space scientific appli-

cations for NASA-JPL and the Manned Spacecraft Advanced Television Study completed for the NASA Manned Spacecraft Center.

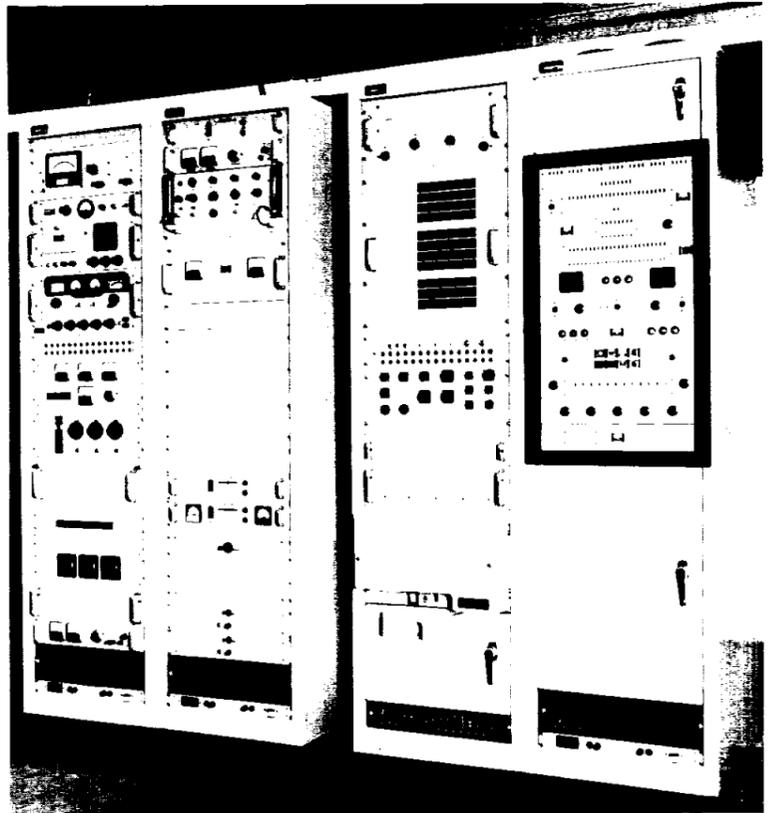
This latter was a basic study into the methods of digital processing of television data with emphasis on bandwidth compression and a comparison of methods to determine various tradeoffs.

EMR is also the prime contractor for Project Telescope the major scientific experiment slated for the first NASA Orbiting Astronomical Observatory. By means of sophisticated electro-optics including ultra-violet sensitive TV pickups this system will map the radiant intensity of the sky to obtain UV spectra of a large number of stars.

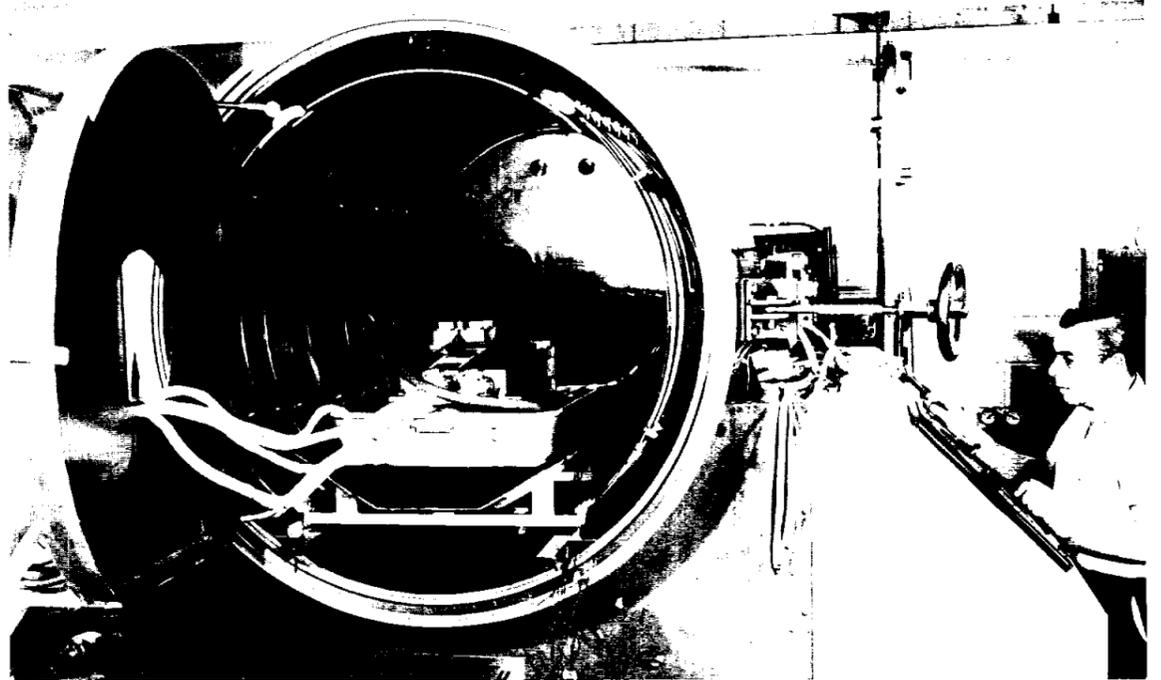
The system supplied by EMR comprises the electro-optics with unique analog or digital mode television, PCM data processing system, and command control system for providing up to 21 on-off and 24 parameter adjustments to the experiment.



CHARLES B. HUSICK, program manager, Gemini Program. Husick is a member of the Sarasota Division of Electro-Mechanical Research, Inc. He is in charge of the entire Gemini Program at EMR including the airborne spacecraft data transmission system and the ground checkout equipment.

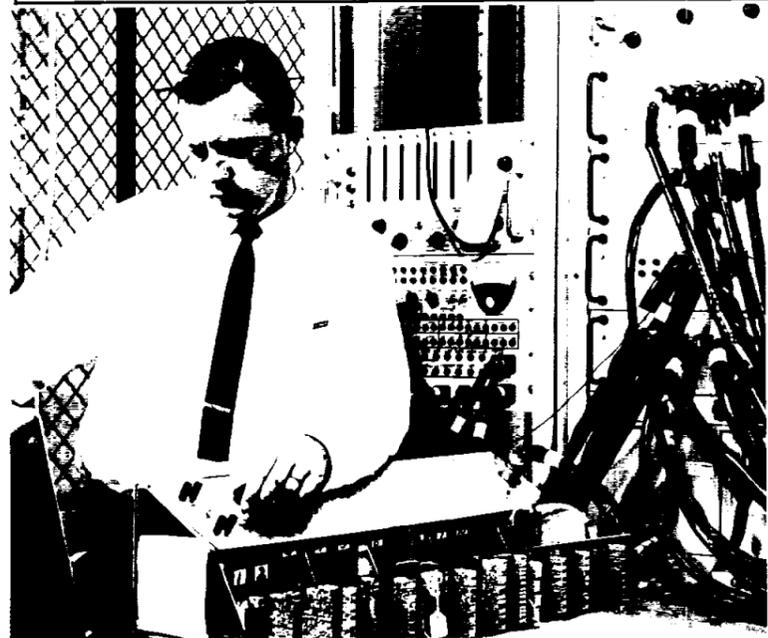


GEMINI TEST SET—A portion of the 040-3 Test Set for Project Gemini is shown above. The four racks (l. to r.) perform the following functions: Rack 1—Transmitter test set which checks the three solid-state telemetry transmitters; Rack 2—Power supply and signal generator portion; Rack 3—Analog distribution, stimulation signals and printer; Rack 4—Test programmer and logical control.

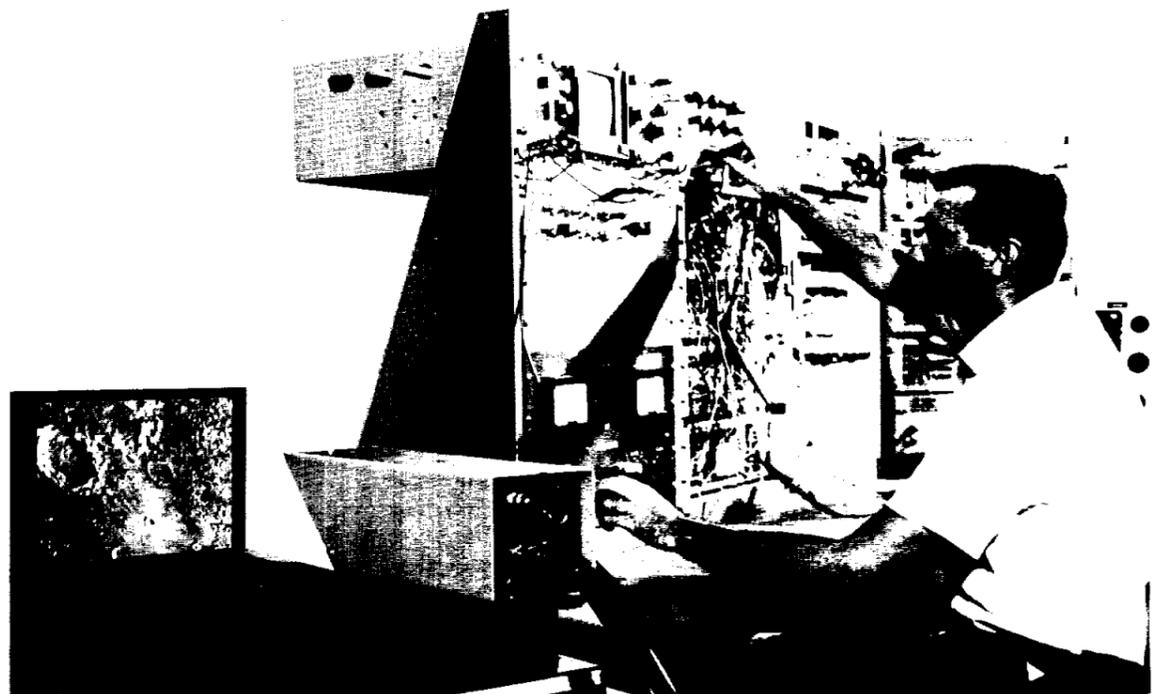


THERMAL VACUUM CHAMBER TEST—The Gemini spacecraft pulse code modulation (PCM) system is shown mounted in the thermal vacuum chamber at EMR prior to flight-qualification environmental tests. The system is mounted on a cold plate heat exchanger which functions identically to that in the spacecraft. EMR test supervisor, Bob Thompson, is at the control panel.

EDITOR'S NOTE: This is the thirty-second in a series of articles designed to acquaint MSC personnel with the Center's industrial family, the contractors who make MSC spacecraft, their launch vehicles and associated equipment. The material on these two pages was furnished by the Public Relations Department, Electro-Mechanical Research, Inc.



TELEMETRY TEST EQUIPMENT—The EMR In-House Test Set shown simulates all Gemini spacecraft interfaces with the digital telemetry system providing stimuli necessary to exercise the telemetry fully. Test results including errors are recorded automatically. EMR test equipment design engineer, J. W. Terry, is at the controls.

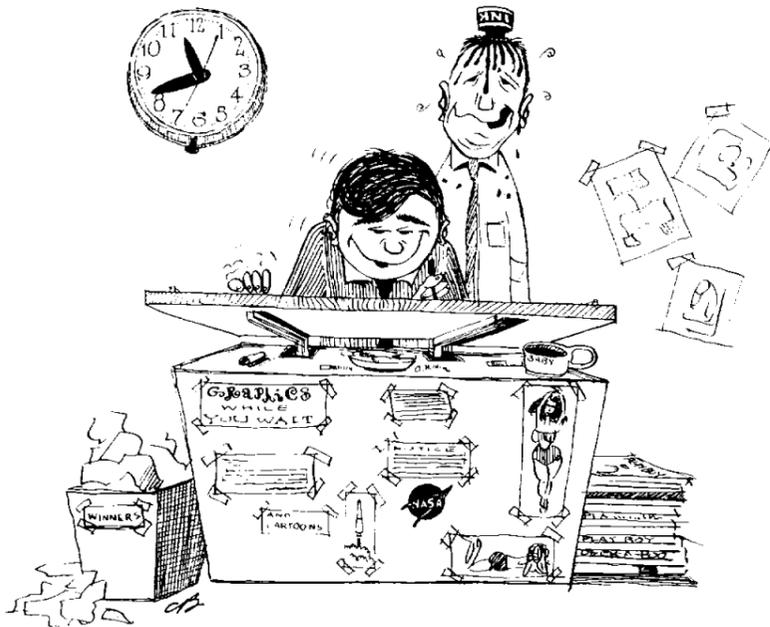


DIGITAL TV—Technician, T. L. Dees, is shown at the controls of the EMR EDITS (Experimental Digital Television System) used in the advanced television studies for the NASA Manned Spacecraft Center.

The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

Director . . . . . Robert R. Gilruth  
 Public Affairs Officer . . . . . Paul Haney  
 Chief, News Services Branch . . . . . Ben Gillespie  
 Editor . . . . . Milton E. Reim

## On The Lighter Side



"Does that mean I can't get my charts before noon?"

## Your Pay Raise And You

What happened to your recent Pay Raise? Have you used it for something important?—Or has it gone through the hole in your pocket? Don't let that happen. Put part of your raise into savings where it counts. Do it the way millions do—in the Payroll Savings Plan for U. S. Savings Bonds, where it grows automatically.

Bonds are a safe, sure investment. Even if lost, stolen or destroyed, they are replaced free of charge; yet, the cash is readily available should the individual really need it in a hurry.

The Federal Employees Salary Act of 1964 that went into effect July 5, 1964 can mean a great deal to employees toward realizing some of their really important goals, if part of the raise is set aside regularly in U. S. Savings Bonds.

Your Pay Raise will mean more to you *tomorrow* if you put part of it in Savings Bonds *today*. The Payroll Savings Plan offers a convenient, automatic, easy way to buy them. All employees are encouraged to sign up today.

## Instruction Issued To Guide NASA Participation In Public Functions

A NASA Instruction was issued recently to provide a guide to federal department and agency officials on acceptance of speaking engagements and on participation in conferences.

The White House Instruction was accompanied with instructions for NASA employees compliance with this policy from James E. Webb, administrator of NASA.

NASA Instruction 3-1-5.5 reads as follows:

"It is the goal and policy of this Administration to secure equal treatment and equal opportunity for all Americans and to assure that no Federal program operates to encourage or support racial segregation. President Johnson has stated, "As far as the writ of Federal law will run, we must abolish not

some but all racial discrimination."

Pursuant to this policy, government public information programs, educational activities and services of a like character should be available to all persons on an equal basis. Care must be exercised that acceptance of speaking engagements and participation in conferences by Federal officials is consistent with this policy. Officials should not participate in conferences or speak before audiences where any racial group has been segregated or excluded from the

## Welcome Aboard

Sixty-two new employees joined the Manned Spacecraft Center during the last reporting period. Fifty-one were assigned here in Houston, 10 to Cape Kennedy, and one to Downey, Calif.

**RELIABILITY AND QUALITY ASSURANCE DIVISION:** Daniel D. Becker, and Mary M. Hamborsky.

**RESIDENT BUSINESS MANAGEMENT REPRESENTATIVE (Downey, Calif.):** Mary Ellen Smith.

**MANAGEMENT ANALYSIS DIVISION:** Joe D. Bennett Jr.

**LOGISTICS DIVISION:** Eleanor L. Johnson.

**PROCUREMENT AND CONTRACTS DIVISION:** John R. Falkenham, Martin L. Hooper, Eileen M. McSweeney, and Clinton B. Wells.

**ENGINEERING DIVISION:** Kenneth L. Jones.

**TECHNICAL SERVICES DIVISION:** Don Andrews, Campbell P. Canup, Lawrence A. Hayman, Robert G. Lauhon, Allan L. Manning, Charles A. Moore, Melvin L. Patrick, Craig Pemberton, James M. Peterson, Joseph M. Schmitt, and Marvin F. Williams Jr.

**INFORMATION SYSTEMS DIVISION:** Kathryn A. Parker.

**COMPUTATION AND ANALYSIS DIVISION:** Arthur W. Hambleton, William J. B. Oldham, and Lloyd Turberville.

**INSTRUMENTATION AND ELECTRONIC SYSTEMS DIVISION:** Forrest E. Eastman, Gerald F. Flanagan, Ray D. Martin, and Helen E. Sledge.

### GUIDANCE AND CON-

meeting, from any of the facilities or the conferences or from membership in the group.

When requests for speakers or participation are received under circumstances where segregation may be practiced, there is a clear obligation to make specific inquiry as to the practices of the group before acceptance is given. If the inviting group expresses a willingness to discuss modification of its practices for the occasion, obviously the department should cooperate in such efforts.

The Federal government should not sponsor, support, or financially assist, directly or indirectly, any conference, convention or meeting held under circumstances where participants are segregated or are treated unequally because of race. This policy includes the granting of Federal funds to reimburse the expenditures of non-Federal agencies under grant-in-aid programs.

If the Federal civil rights program would be better served by permitting an exception to this policy in a particular case, the head of the department or agency should be advised prior to making any commitments for his confirmation of the waiver."

## MSC PERSONALITY

### Warren Gillespie Made Early Decision On His Career Field

As a young boy with an avid interest in building and flying model airplanes, Warren Gillespie Jr., technical assistant to the Assistant Director for Engineering and Development, made his decision to enter the field of aeronautical engineering.

One of the fruits of his model airplane hobby (a hobby which he still follows) was to win the Houston, Tex., model airplane contest in 1935 and a free trip to Cleveland, Ohio. In 1954 he was a member of the U.S.A. Wakefield model airplane team, competing with teams from over the World at the Long Island, N.Y. meet.

Gillespie was born in Paterson, N. J. He completed high school at Sam Houston High School and in 1941 was graduated from Rice Institute (now Rice University) with a BS degree in mechanical engineering. In 1947 he received his MS degree in aeronautical engineering from the Massachusetts Institute of Technology.

He was an aircraft structures engineer with Convair-General Dynamics at San Diego and Ft. Worth from 1941 to 1946. One of his jobs was to be in charge of B-32 wing structural analyses. From 1947 to 1948 he was an aerodynamicist with Convair conducting a generalized bomber performance study and also performance of the B-36 with turbo-prop engines.

Gillespie was an aeronautical research engineer from 1948 to 1962 with NACA, Applied Materials and Physics Division at Langley Research Center,

**TROL DIVISION:** Morton L. Bystock, Shirley A. Gold, and Edward L. Tilton III.

**PROPULSION AND POWER DIVISION:** Robert L. Kerr, and Brian G. Morris.

**STRUCTURES AND MECHANICS DIVISION:** Eddie J. Jung Jr., and Elizabeth C. McDaniel.

**ASSISTANT DIRECTOR FOR FLIGHT OPERATIONS:** Karla B. Garnuch, Alice T. Groves, and Faye D. Pinte.

**FLIGHT CONTROL DIVISION:** William C. Burton, Oscar W. Olszewski, and Jacqueline E. Price.

**RECOVERY OPERATIONS DIVISION:** Bruce W. Larson.

**MISSION PLANNING AND ANALYSIS DIVISION:** Kent D. Grimsley, Don E. Farmer, Richard M. Moore Jr., and James V. West.

**GEMINI PROGRAM OFFICE:** Marlene M. Malinak, Alva Lynn Smith, Ruby J. Summers, and John A. Zill.

**MSC-FLORIDA OPERATIONS (Cape Kennedy, Fla.):** Floyd A. Curington, John F. Heard, Peter E. Hellebrand, Robert C. Ketterer Jr., Donald E. Longhofer, Charles E. Pearce, Lauretta M. Peters, Betty Gwin Powell, Richard J. Teti, and Helen P. Webb.

**APOLLO SPACECRAFT PROGRAM OFFICE:** Nancy H. Gabriel.

where from 1958 to 1962 he assisted the head of the Space Vehicle Group and had technical responsibility for programs in solar power generation and spacecraft attitude control.

He joined the Manned Spacecraft Center in February 1962 as



WARREN GILLESPIE JR.

an aerospace engineer, Space Physics Division (now integrated with the Advanced Spacecraft Technology Division), and assumed his present duties in May 1963.

His duties as technical assistant include approval of Engineering and Development technical reports and speeches, and advising in areas of advanced technology and space science.

Gillespie is also manager for the monthly MSC Technical Symposia; MSC liaison with Jet Propulsion Laboratories; and E and D member for MSC Flight Experiments Review Panel.

Research fields Gillespie has specialized in include: aerodynamic stability and performance of high-speed airplane and missile configurations employing free-flight rocket-boosted scale models; passive-type communications satellites; solar power generation; and spacecraft attitude control.

He is the author of 21 technical papers on the above fields and is a joint holder of a patent for an infrared scanner, and also received an award for his invention entitled "Passive Communications Satellite."

Gillespie is a member of the American Institute of Aeronautics and Astronautics, the American Astronautical Society, Tau Beta Pi, and Sigma Xi.

He is married to the former Alice Jennings Hingston of Brookline, Mass., and the couple has three boys—Warren Leighton 14, John David 11, and William Dean 6. The family resides in Friendswood, Tex.

In addition to his life-long hobby of model airplanes he enjoys ping-pong, tennis and bowling.

## 12,000 Page Library For Apollo, Condensed To Three-Pound Package

A 12,000-page library of documents, together with a projection system and scroll-type logbook, are being compressed into a package thinner than a metropolitan telephone directory for use by Apollo astronauts.

The package, called a Flight Kit Assembly, is being developed by engineers at North American Aviation's Space and Information Systems Division, Downey, Calif., for NASA's Manned Spacecraft Center.

The kit, which will be nine and one-half inches wide, eleven and three-quarters inches long, and two and one-half inches deep, will contain the equivalent of about 12,000 pages of manuals, maps and navigation data—material which would weigh more than 79 pounds if printed on ultra-thin standard-sized paper.

The entire kit will weigh three pounds.

Each Apollo spacecraft command module will be equipped with two flight kits, thus replacing the equivalent of 158 pounds.

The Flight Kit Assembly consists of a locking case with a hinged cover which serves as a lapboard writing surface. The

cover has a 4 x 5 inch projection screen in the upper left hand corner. The case will be waterproof and shock-resistant. This film will be coded and indexed so that an astronaut can select any page, from 1 to 12,000, and get it on the display screen in a maximum of 15 seconds.

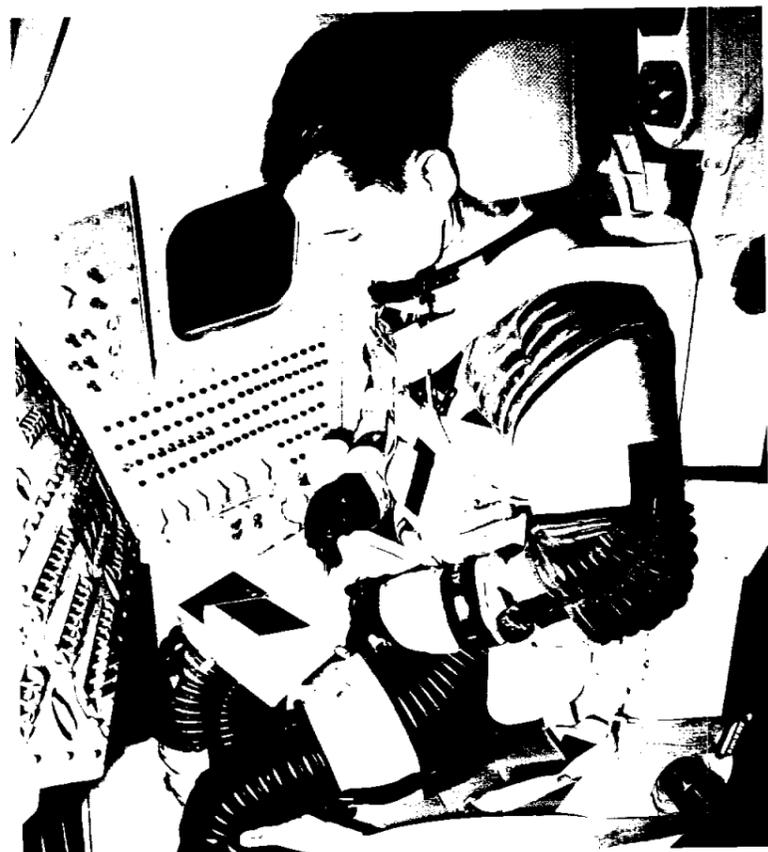
The flight kit is designed to provide Apollo astronauts with vital technical data, to provide a logbook for recording scientific observation and other information, and to provide navigational data for use during the mission.

It will contain such data as manuals on operation, testing and repair of all systems in the Apollo spacecraft, star and lunar

charts, navigation data, information for medical checks and for emergency medical treatment, equipment maintenance data and plans for meeting emergencies.

Because of its compactness, the kit can be carried with the astronauts into the lunar landing vehicle and onto the moon's surface.

The kit may be adaptable to commercial use. Pilots, for instance, could use it with little change except for the technical data included. It could also prove useful in areas where a large amount of technical information is required in field conditions.



SPACE FILM—Space-suited engineer holds and tests early model of flight kit assembly which will store for astronauts the equivalent of a 12,000-page library of documents. The kit is under development by North American's Space Division, Downey, Calif., principal contractor on the Apollo spacecraft command and service modules for NASA's Manned Spacecraft Center.

## Largest Solid Rocket Completed, To Be Ready For Tests In Fall

The largest solid propellant rocket motor segment cast to date in the Free World rolled uneventfully last month over 25 miles of Southern California freeway and side streets from its manufacturing plant to the base where it will be test-fired in the fall.

Carried horizontally on a massive trailer over 100 feet in total length, the 140-ton center segment of Lockheed Propulsion Company's 156-inch-diameter rocket motor is nearly 24 feet long. The additional length of the carrier vehicle is required to spread the weight over 64 wheels on eight axles.

This was the second such trip for the giant rocket section. Four months ago, loaded with a smaller quantity of propellant, it was transported from Lockheed's Redlands, Calif., headquarters to its Potrero Production and Test Facility near Beaumont, Calif. There, it was joined with two other segments of almost equal size for the first static test firing of a 156-inch-diameter segmented solid propellant rocket motor.

That firing, successfully conducted on May 28, marked the

first of a series of feasibility demonstration firings in the nation's program to develop giant "building-block" rockets for future missile and space assignments.

The Space Systems Division, Air Force Systems Command, is executive manager of the program, which is being carried out on behalf of both the Department of Defense and the National Aeronautics and Space Administration.

For the first firing, the motor, composed of a single segment with forward and aft closures and nozzle, stood nearly 75 feet tall. It contained almost 500,000 pounds of rubber-based solid propellant, burned for 109 seconds and developed an average of 900,000 pounds of thrust.

The identical motor chamber

will be used for the second firing, but it will be loaded with 30 per cent more propellant, about 650,000 pounds, and it will develop well over one million pounds of thrust.

The case segment is made of a new, high-strength steel alloy containing 18 per cent nickel, called maraging (for MARTIN-SITIC AGING) steel. Only three-eighths of an inch thick, it can withstand stresses in excess of 250,000 pounds per square inch.



APOLLO LEM TEST SITE—Final phases of construction are under way at the Lunar Excursion Module test area at MSC-White Sands Operations, New Mexico. Scheduled for completion this month is Test Stand Two, the corrugated building top left. Test Stand One, with its altitude simulation tank already in place, will be finished at the first of the year. Stand Three, a carbon copy of Stand One and its adjoining Stand Support Building, is to be completed later. An overhead gantry running the length of the three-stand complex will lift LEM's motors into and out of the test stands.

### Space News Of Five Years Ago

September 1-7, 1959—McDonnell Aircraft moved a segment of its Mercury effort to Cape Canaveral in preparation for the operational phase of the program.

September 9, 1959—A Big Joe Atlas boilerplate Mercury spacecraft model was launched and flown from Cape Canaveral, although booster-engine separation did not occur, the flight was considered highly successful, and a majority of the test objectives were attained. The spacecraft was picked up by the recovery force about eight hours after lift-off.

September 10-11, 1959—At a Mercury spacecraft mock-up review, the astronauts submitted several recommended changes which involved a new instrument panel, a forward centerline window, and an explosive side egress hatch.

September 12, 1959—Russia's LUNIK II, launched with a payload weight of 858.4 pounds, became the first man-made object to hit the moon.

September 15, 1959—Walter C. Williams was appointed associate director for Project Mercury Operations, and also the prime NASA-DOD contact for Mercury flight operations.

PIPELINES TO SPACE—Data from a simulated outer space environment will be fed from the Lunar Excursion Module altitude tank, top right, into the Test Control Building by way of the cable-carrying conduits being prepared for mating at the White Sands Operations LEM test area. Test Stand One and the identical altitude-simulating Test Stand Three are scheduled for completion around the first of the year. A near vacuum will be induced in the heavy steel cans by the injection of steam. Both the ascent and descent propulsion systems of the Lunar Excursion Module, as well as the reaction control system, will be tested at the White Sands site.

Space News **ROUNDUP!**

SECOND FRONT PAGE

**Apollo Preflight Acceptance Testing Station Operational**

The National Aeronautics and Space Administration announced last week that the first Apollo spacecraft preflight acceptance testing station has been declared operational by Manned Spacecraft Center engineers at the North American Aviation plant in Downey, Calif.

The station, called ACE-S/C, which stands for Acceptance Checkout Equipment for Spacecraft, will provide a high-speed, accurate and reliable system to test sophisticated space-flight vehicles such as the three-man Apollo spacecraft.

ACE-S/C interrogates the spacecraft systems and gathers, processes and displays large quantities of test data in real time for immediate evaluation and diagnosis. The data is also recorded and stored for future analysis.

The system allows a relatively small staff of engineers to monitor and control continually more than 25,600 samples per second of spacecraft test data containing approximately 1,500 separate spacecraft parameters. Coaxial cables connect the ACE-S/C station and the spacecraft being checked.

Used for subsystem and integrated system testing of the Apollo spacecraft command and service modules, the first ACE-S/C station has been undergoing verification operations by engineers from NASA; General Electric Company, Apollo Support Department, Daytona Beach, Fla., the prime contractor; Control Data Corporation, Minneapolis, Minn. and Radiation Inc., Melbourne, Fla., associate contractors. The station is located in three rooms overlooking the high-bay spacecraft assembly and test area of North American Aviation's Space and Information Systems Division.

The ACE-S/C Control Room houses the station's primary controls and displays. Here, spacecraft test engineers re-

motely monitor and begin operation of each spacecraft system.

Primary functional systems such as spacecraft communications, environmental control, and guidance and navigation are tested simultaneously. Test engineers maintain system status via updated data on television-like displays, including event lights, meters strip chart recorders, and other readout devices.

High-speed digital computers and decommutators are contained in the ACE-S/C Computer Room. This equipment unscrambles commands from the Control Room and sends them to appropriate locations in the spacecraft. These electronic brains also decode test results from the spacecraft and route them to the Control Room.

A third room, the ACE-S/C Terminal Facility Room, provides a flexible interface between the remote spacecraft test areas and the ACE-S/C station. Information is routed through the Terminal Facility Room to and from the spacecraft, the Control and Computer rooms.

ACE-S/C stations will also be installed at Grumman Aircraft Engineering Corp. at Bethpage, N. Y., for Apollo spacecraft Lunar Excursion Module testing and checkout; at the Manned Spacecraft Center, for testing spacecraft in simulated space and lunar environments; and at MSC-FO facilities on Merritt Island, Fla., to conduct a complete range of Apollo spacecraft subsystem, integrated system, and compatibility testing up to and including launch.



**WEIGHTLESS ASTRONAUTS**—An Air Force technician at the left, observes the somewhat comical situation of Astronauts Edwin Aldrin, Charles Bassett, and Theodore Freeman as they experience a few seconds of weightlessness in the parabolic curve of an Air Force C-135 jet aircraft.

**Six Astronauts Get 'Feel' Of Space In Jet Aircraft Weightless Flights**

Six of the newest group of 14 astronauts were given a taste of the weightlessness that will greet them on their rides through space, as they flew in a jet, roller-coaster fashion through the skies in the Dayton, Ohio area, August 17 and 18.

All 14 were scheduled to fly the weightless flights but due to mechanical difficulties encountered in the Air Force KC-135 jet aircraft used for the tests, the other eight will have to fly at a later date.

Participating in the tests were Astronauts Edwin E. Aldrin, Alan L. Bean, Charles A. Bassett, Walter Cunningham, Theodore C. Freeman, and Russell L. Schweickart.

In periods of weightlessness that lasted from 20 to 30 seconds the six astronauts were given some idea of how it will be in the environment of space without gravity and what it would be like on the moon and mars where the gravity is less than that on earth.

As they flew hither and yonder in a weightless condition for periods of seconds in the well padded interior of the air-

craft, the astronauts played catch with a big medicine ball that refused to fall, and even staged an impromptu wrestling match or two while hovering three feet above the floor.

The four-engine jet modified its maneuvers slightly and put them on the moon, where a man who can leap six feet, suddenly finds he can jump 36 feet. The astronauts promptly proved it by dashing from one end of the long cabin to the other in 16-foot strides.

They also discovered that it is difficult to concentrate on eating when one's feet keep bouncing off the walls and ceiling.

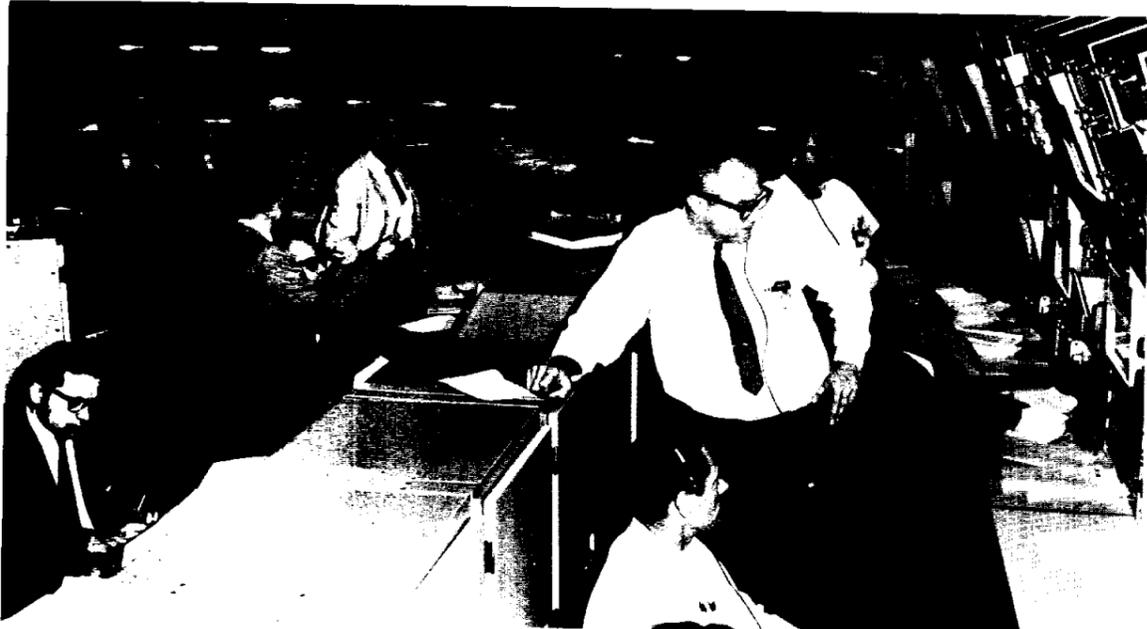
After soaring around the cabin for awhile, with several near-collisions, they tried getting

around while wearing blindfolds, discovering in a weightlessness condition it is impossible to detect any "up" or "down" without the aid of seeing.

They tried tightening a screw with a wrench. One wrenched the screw completely off the wall.

And finally, they donned a back pack, complete with jets for propelling them from place to place. The astronauts found it works fine, if somewhat clumsily.

The conclusion of all participating was that all those reflexes built up and trained on earth suddenly need to go back to school to learn how to get along without the comforting pull of gravity.



**APOLLO CHECKOUT EQUIPMENT**—Engineers of the Manned Spacecraft Center—Florida Operations and contractor systems engineers, monitor consoles and indicators in the Control Room during installation of the first operational Acceptance Checkout Equipment for Spacecraft (ACE-S/C) station at the North American Aviation facility in Downey, Calif.



**MSC'S MOONPORT**—A flat brush area at the Manned Spacecraft Center is being turned into a rugged, pitted surface resembling that of the moon. Eventually, a model of the lunar excursion module will be placed in the area so that astronauts can use it and the area for training purposes. Dr. Ted Foss, left, and Uel Clanton, both of the Aerospace Technology Division, inspect a clay model of the lunar surface, at the site of the excavation.